

likely to survive and to perpetuate dark forms. Mr. Porritt did not believe that birds fed to any great extent on moths, and when they did they took them on the wing at night, when their colour similarity to trees would be of no service. Moreover, many melanic species do not affect tree trunks, e.g. *Larentia multistrigaria*, in which melanism has rapidly developed for no apparent reason. The theory that smoke and humidity in the manufacturing districts have caused melanism, although offering in many cases a likely explanation, seems to be rendered untenable by numerous exceptions. Mr. Doncaster remarked that melanism could not be explained as due to natural selection or as the result of external conditions, as the black forms in some cases arose suddenly, and quickly became numerous. The black form is dominant, that is, the offspring of a pair, one black and one pale, have a tendency to be dark. Dr. Dixey pointed out that in Pierines dark pigment is often substituted for light, the female being usually darker. There may even be two grades of colour in the females, a darker in the individuals found in the wet season, and a lighter in those found in the dry season. He considered that locality, altitude, and other conditions may have an influence in darkening the pigment.

Pineal Eye of Geotria and Sphenodon.

Prof. Dendy described the structure of the pineal eye of the New Zealand lamprey (*Geotria*), which agrees in most respects with that of *Petromyzon*, but the former is more complex in histological structure, its pigment cells being divided into inner and outer segments. The pineal nerve is connected both with the right habenular ganglion and the posterior commissure, and in all probability with Reissner's fibre, whereby it would become linked with the optic reflex apparatus described by Sargent. Prof. Dendy also directed attention to some newly observed details of structure in the adult pineal eye of *Sphenodon*. The rods of the retina project into the cavity of the eye, and are connected with a network of fibres, which is also connected with the "lens." The lens contains a large central cell which resembles a unipolar ganglion cell. Prof. Dendy concluded that, in both *Geotria* and *Sphenodon*, the pineal eye is a functional organ.

Formation of Nucleoli.

Prof. Havet (Louvain) traced the formation of true nucleoli or plasmosomes in the nerve cells and blood cells of *Rana* and *Alytes*. The central part of each is formed from a small, clear area situated in the centre of the telophasic figure, while the peripheral part is derived from the internal extremities of the chromosomes which remain when the rest of the chromosomes form the nuclear network. Occasionally chromosomes also become included in the central area, giving rise there to one or two chromatic structures.

Milk Dentition of the Primitive Elephant.

Dr. C. W. Andrews, in the course of a paper on the milk dentition of the primitive elephant, pointed out that in recent elephants, owing to the large size of the molars and the shortening of the jaws, the teeth have an almost horizontal succession, their manner of replacement differing widely from the vertical succession found in other mammals. But as the earlier relatives of the elephant are followed back through the various Tertiary horizons a gradual approximation to the ordinary mammalian type of tooth replacement is observed, until in the recently discovered Eocene *Palæomastodon* a form is reached in which the milk molars are replaced in the normal way by premolars, which, along with the permanent molars, remain in use throughout the life of the animal.

A New Conception of Segregation.

Mr. A. D. Darbishire directed attention to some essential but usually unrecognised features of the Mendelian theory. He pointed out that although half the total number of children born to hybrids were unlike their parents, the hybrids, according to that theory, bore no single germ cell containing an element representing an animal like themselves, and that if a hybrid could be made to multiply

parthenogenetically it would produce no offspring like itself. An experiment for testing this theory in an individual case was described.

Mr. J. T. Cunningham spoke on the evolution of the cock's comb; Mr. H. M. Bernard, on a periodic law in organic evolution, with a re-estimation of the cell; and Dr. H. J. Fleure and Miss Galloway gave a detailed paper on the habits of the Galatheidæ in relation to their structure; but these and a few other papers do not lend themselves to the purposes of a summary.

J. H. ASHWORTH.

THE ROYAL PHOTOGRAPHIC SOCIETY'S ANNUAL EXHIBITION.

THIS exhibition at the New Gallery in Regent Street will remain open until October 27. The three rooms, the central court, and the balcony, indicate its five main divisions. The last of these is devoted to scientific and technical photography and its application to processes of reproduction, and the exhibits here naturally fall into three sections, namely, the ordinary exhibits, those contributed by special invitation of the council of the society, and a small collection of photographs that have no other interest than that they are good technical work, and represent subjects of more or less interest, chiefly architectural. We hope to see this kind of work more fully represented in future exhibitions, for between the more strictly technical and the ultra-pictorial it has been almost squeezed out of existence.

A series of beautifully made models of light-pencils, which show the various effects of aberrations that particularly concern photographic lenses, is shown by Mr. C. Welborne Piper, and has been awarded a medal. The three dozen models illustrate very clearly a subject that must always be a somewhat difficult one. Immediately following this are a large number of photographs of living things, but chiefly birds, which appear to be receiving a very undue share of attention just now. Of these, we notice particularly a series of twenty-four photographs of the stone curlew in different stages of its existence, by Mr. W. Farren. Of the other subjects, "A Study of Wych Elms," by Mr. Alfred W. Dennis, is among the more novel. It is a series of seven photographs that show the same pair of trees, leafless and in leaf, and on larger scales the details of the trunk, blossom, fruit, leaves, and winter buds. Dr. Vaughan Cornish sends a further series of waves; Mr. J. C. Burrow two coal-mine subjects, excellently rendered as usual; and Mr. Bagot Molesworth a telephotograph of Vesuvius in eruption, taken from a distance of eight miles.

In the invitation section, Mr. Douglas English shows some examples of mimicry in British insects, and a particularly realistic effect is obtained in some of them by making the original carbon print with a green tissue, and staining the insects with dyes to represent their natural colours. The Royal Observatory, Greenwich, has contributed several of its recent results, including some of last year's solar eclipse. Mr. F. E. Baxandall (for Sir Norman Lockyer) also illustrates the eclipse, and sends photographs of two British stone circles that were erected some four thousand years ago as astronomical observatories. Series of cloud photographs are shown by Dr. W. J. S. Lockyer and Captain D. Wilson-Barker. Photographs illustrating the investigation of crimes, such as forgery and burglary, and the detection of the criminals, by Prof. R. A. Reiss, of Lausanne, will be of very general interest. Mr. K. J. Tarrant shows a series of thirty photographs of high-tension electrical discharges. Mr. Edgar Senior has continued his study of the Lippmann method of colour photography, and although the image generally shows no grain under the microscope, he has by special illumination got the surface to appear covered with discs of light, though what these indicate is not very clear.

There are a few photographs in "natural colours," but nothing better than, if quite so good as, has already been shown. Messrs. Sanger-Shepherd and Co., by preparing a more rapid and red-sensitive plate and special colour filters,

have made it possible to take the three negatives necessary for their method of colour photography in three seconds, including the time required for changing the plates and light filters, when the light is only moderate and the lens aperture $f/16$. In the central court, besides a great deal of apparatus and several demonstrations of processes, the Adhesive Dry Mounting Co. shows its method of mounting by warm pressure. The Ozotype Co. shows in the north room several examples of "ozobrome" prints. These are quite a new departure, a carbon print being produced by means of a bromide print without exposure to light, the silver image in the bromide print reducing the bichromate in the carbon tissue by mere contact. The original bromide prints and the carbon copies are shown side by side. C. J.

GEODETIC OPERATIONS IN SOUTH AFRICA.

IT will be admitted that the Administration of Southern Rhodesia acted wisely in accepting the timely counsel which Sir David Gill brought under its consideration. Some ten years ago His Majesty's Astronomer at the Cape pointed out to Lord Grey, who then administered the government of the colony, the desirability of basing the land tenure on a properly established system of survey. The adoption of such a course would not only afford the means of supplying a sound and incontrovertible evidence of title to the possessor, but would protect the Government against the perpetration of fraud and tend to diminish future litigation. Sir David Gill does not hesitate to say that in Cape Colony large tracts of land have been stolen from the Government, either through the wilful shifting of beacon marks or from carelessness due to inadequate surveying. Sir David Gill did not lay any great stress upon the scientific value that necessarily attaches to accurate measurement conducted on a large scale; but this point was not neglected, and the work was planned so as to give the greatest assistance to economic requirements, and at the same time to forward scientific interests. The one purpose was effected by carrying a chain of triangles eastwards from Bulawayo, covering the most thickly populated and important parts of the country, the other by extending the chain north and south along the thirtieth meridian, so that it might form part of the great arc of meridian which it is proposed to extend from the south of Natal to the Mediterranean. The actual district surveyed extends from about 16° to 20° south latitude and from 28° to 31° east longitude.

Sir David Gill sketches the history of the work accomplished in successive years, from which can be gathered something of the difficulties which Mr. Simms and his assistants encountered and overcame. Abnormally wet seasons, illness among the staff, the necessary burning of the grass and the rising of the smoke preventing the measurement of horizontal angles, loss of cattle, and in one instance the destruction of the theodolite, are a few of the troubles that beset those who attempted geodetic operations in an unsettled country; but, notwithstanding these drawbacks, there remained only three stations south of the Zambezi which were not fully connected with the scheme of triangulation proposed. As the work is extended northwards these stations will be occupied, and thus form a useful link in the two systems.

A matter of great interest in the report from a scientific point of view consists in the critical examination of the Jäderin wires used in the measurement of the base lines. This apparently convenient form of measurement was, it is believed, adopted by the Russian geodesists in the work connected with the Spitsbergen base, but in this country the apparatus has not been submitted to any very thorough test, and figures for the first time on a large scale in the geodetic survey of South Africa. Two wires, one of steel and the other of brass, constitute a "pair," and, as a rule, were used in this form. Each wire is about 1.65 mm. in diameter, and is stretched by an accurate spring balance with a tension of 10 kilograms. The length of three pairs

was each 80 feet, but two others of 160 feet and 320 feet respectively were used in crossing streams and gulleys. Another form of the same apparatus, occasionally used, consisted of a wire of "invar" nickel-steel and a wire of another alloy having a coefficient of expansion about the same as that of brass. The absolute length of each of these pairs was determined by repeated comparisons with a base line 80 feet in length, measured with a standard bar apparatus; but even the length of this base could not be assumed to be constant. The partially decomposed quartzose slate beneath the piers which carried the fiducial marks appeared to change slightly in position, especially after rain, and the length of this base as measured in the wet and dry seasons differed by half a millimetre. Constant measurement with the bars removed any source of error from this cause, since the change of length between the beginning and end of a set of wire comparisons was practically insensible.

But the real source of error in the use of the Jäderin wires lies in the fact that the ordinary steel and brass wires are liable to change of length, due to re-arrangement of the molecules of the constituent metals which takes place independent of temperature after these molecules have been violently disturbed. The tendency in all new drawn wires is to shorten, very markedly at first, and to diminish in amount as a more stable arrangement of the molecules is established. In a postscript, however, it is stated that, as the result of experiments conducted at the International Bureau of Weights and Measures, it is found possible by careful annealing and special mechanical treatment to render the arrangement of the constituent molecules of "invar" wires practically stable, and that such wires can be used as standards. Such wires, however, are not examined here. As an evidence of the change of length in the wires actually used, we may quote the following:—The length of a standard pair, at a temperature when both components were of equal length, was found to be in

April and May, 1898 24382.07 mm.

October and November, 1898 24381.84 "

Two base lines were measured in the course of the work, one of $11\frac{1}{2}$ miles and the other of $13\frac{1}{2}$ miles. The first, known as the Inseza base, was measured in three sections, the second in seven, each section being measured in opposite directions. As an indication of the accuracy attained we give the repeated measures in the shorter base:—

	Direct	Reverse	Discordance
	mm.	mm.	
Length of Section I.	4,509,571.88	4,509,554.47	1 in 259,000
" " II.	6,200,765.86	6,200,732.18	1 " 184,000
" " III.	8,196,927.19	8,196,928.28	1 " 4,746,000
TOTAL ...	18,907,264.93	18,907,214.93	1 in 378,000

We have not space to quote the results in the case of the Gwibi or longer base, but the results there are even more accordant, the average discrepancy amounting to only one in a million and a half.

W. E. P.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE celebration of the four hundredth anniversary of the foundation of the University of Aberdeen began on Tuesday, and will continue for several days. The commemoration has been planned on a magnificent scale, and the arrangements have been perfectly organised. The formal proceedings opened on Tuesday morning with a service at King's College in commemoration of the founding of the University by Bishop Elphinstone. In the afternoon, at a reception given by the Chancellor (Lord Strathcona) and other high officers of the University, the delegates of the British, colonial, and foreign universities were presented to the Chancellor and delivered their addresses. In the evening a banquet was given by the Lord Provost and the corporation. Among the distinguished foreigners who are taking part in the celebrations are:—Prof. H. Becquerel, Prof. Behring, Dr. C. De

¹ Report of the Geodetic Survey of part of Southern Rhodesia executed by Mr. Alexander Simms, Government Surveyor, under the direction of Sir David Gill, K.C.B., F.R.S., His Majesty's Astronomer at the Cape. Pp. xiv + 146. (Cape Town, 1905.)